Public Agenda Item #3.1

Review and Discussion of the Pension Experience Study
Preliminary Results

July 10, 2017

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ERS of Texas
Experience Study Findings and Recommendations

July 10, 2017

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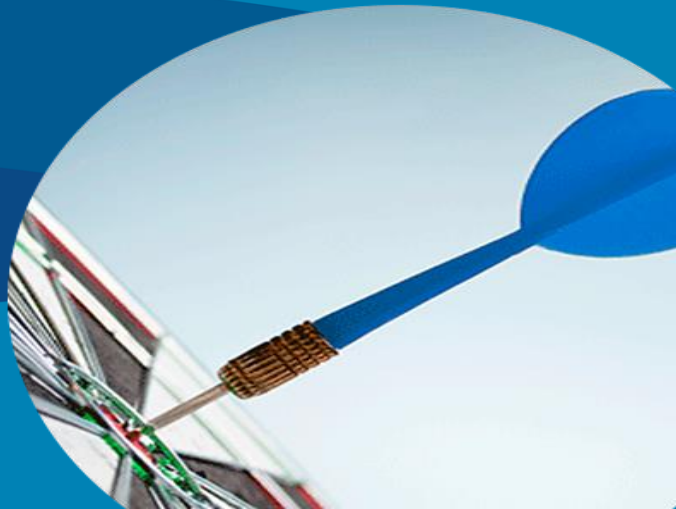

Agenda

- Review of Purpose
- General Findings and Recommendations
- Individual Assumptions
  - Inflation
  - Investment Return
  - Wage Assumptions
  - Mortality
  - Other Demographic Assumptions
- Illustrative Impact

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Reminder

- The *primary* purpose of the annual actuarial valuation is to either (1) set or (2) assess the adequacy of the contribution policy
  - "Funding" or "contribution allocation procedure"
- For ERS, the historical funding policy has been a level "fixed rate" from the employer, and so the valuation is assessing the appropriateness of the current fixed rate

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Purpose of Experience Study

- Actuarial assumptions and methods are utilized to develop each of the outputs of actuarial valuation process
- Experience Study is a regularly scheduled review of the assumptions and methods
  - GFOA recommends at least once every five years
  - ERS will now conduct studies every four years based on recent statutory changes
- General process for setting assumptions and methods
  - Actuary makes recommendations
  - Board considers actuary's recommendation and makes the final decision for the system

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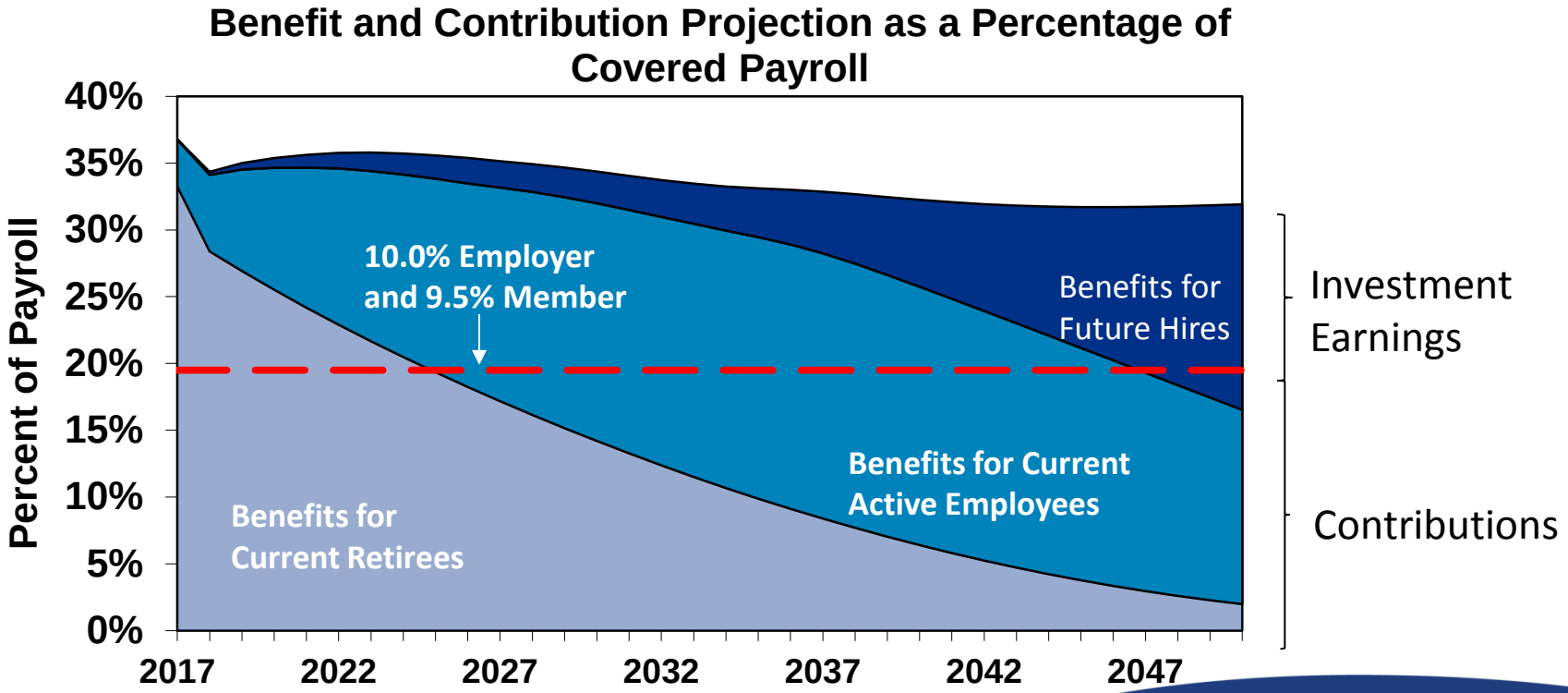
Inside the Actuarial Valuation at the System Level



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Inside the Actuarial Valuation:
Projecting the Liability for each Member

What is the probability the member reaches retirement? (Termination assumption)

When will the member retire? (Retirement assumption)

How much will the benefit be? (Salary increase assumption)

How long will the benefit be paid? (Mortality assumption)

Hired at age 30

Retire at age 60 with annual benefit

Receive benefit for remaining lifetime

- Assumptions must be made to project:
  - Future behavior
    - Voluntary or Involuntary
  - Life expectancy
  - Economic growth

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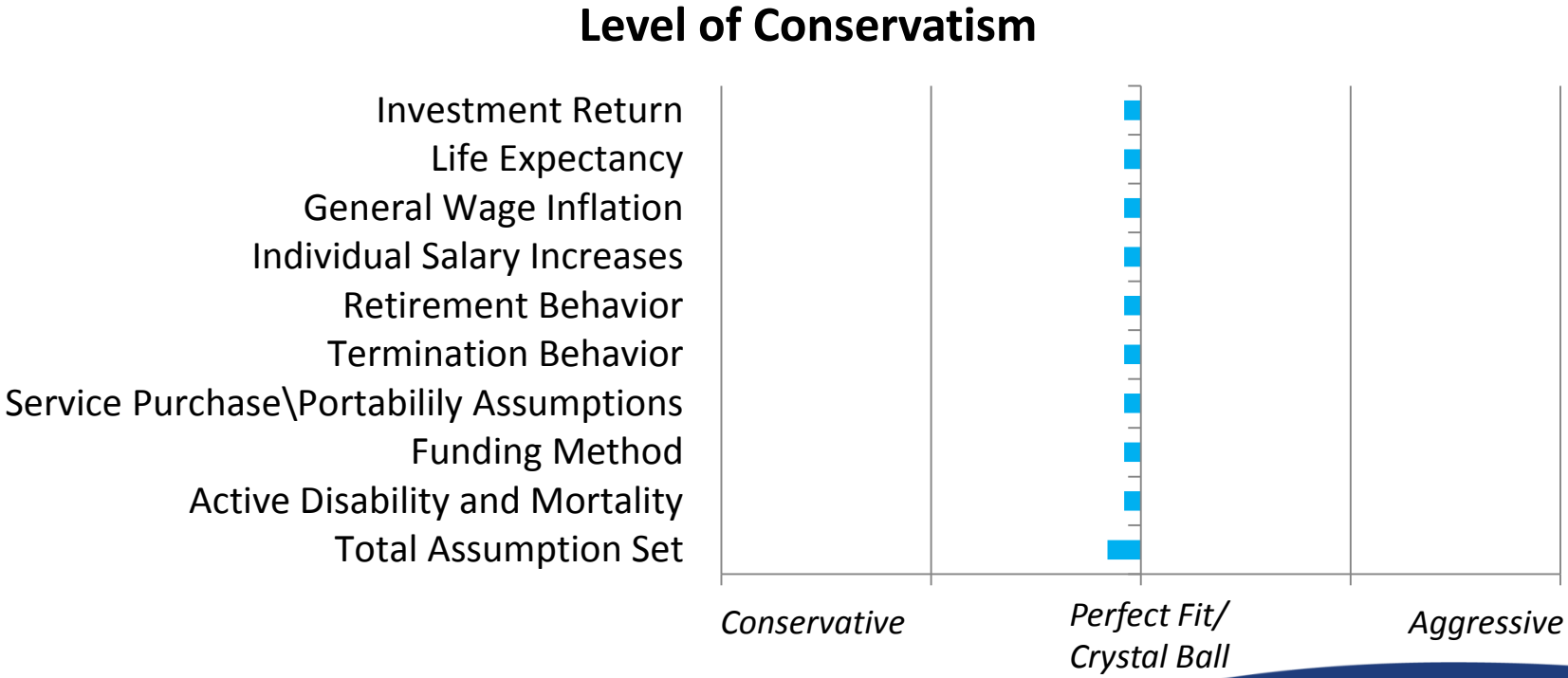
The “Perfect” Assumption Set



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General Findings

- Reviewed ERS-specific experience from August 31, 2011 through August 31, 2016
- Future economic growth likely to continue to be suppressed compared to historical levels
  - Future price inflation, investment returns, overall wage growth, and individual salary increases are likely to be lower than currently assumed
- Retirees continue to live longer, and the expectations for the rates of future improvement should be updated for more recent information
- Several of the assumptions/methods can be simplified
- Most of the other assumptions continue to either be appropriate, or only need minor changes

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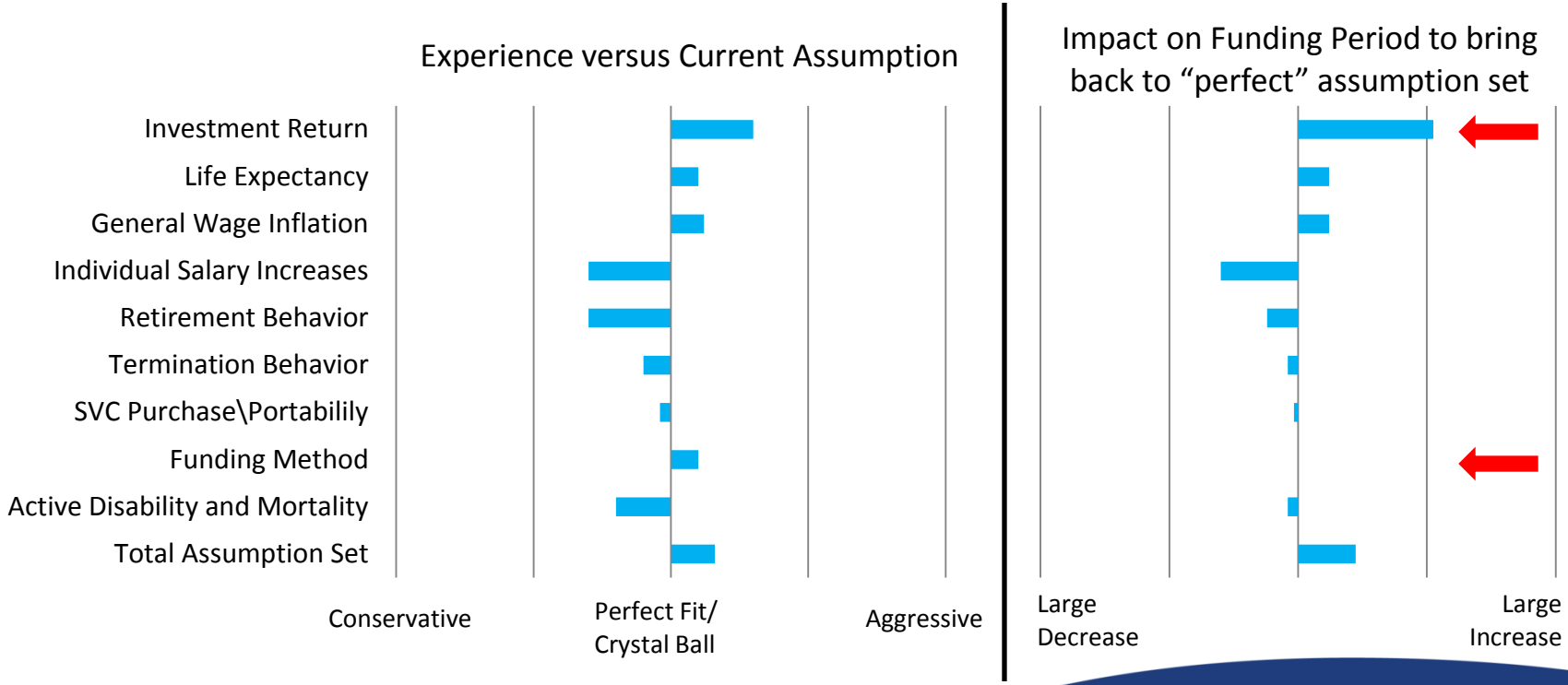
Experience versus the Current Assumption Set



Summary of Recommendations

- Major Recommendations
  - Reduce the nominal investment return assumption to no more than 7.25%
    - Impact on results at 7.00% has also been provided
  - Decrease core inflation assumption from 3.50% to 2.50%
  - Set the general wage inflation (GWI) assumption to 0.50% above inflation
    - Nominal GWI becomes 3.00% (Inflation + 0.50%)
  - For regular State employees, decrease individual salary increase assumption schedules by the same 1.00% as the change in core inflation
    - Nominal annual increase for long service employees decreases from 5.00% to 4.00%
  - For LECOs, decrease individual salary increase assumption schedules by 0.50%
    - 1.00% decrease due to change in core inflation but 0.5% increase in the individual merit and promotion component
    - Nominal annual increase for long service employees decreases from 5.00% to 4.50%
  - Update mortality tables, including the assumption for continued future mortality improvement
    - Proposed assumption based on actual experience of ERS annuitants

Summary of Recommendations

- Minor Recommendations
  - Change the asset smoothing method to a traditional individual year deferral method, but allow direct offsetting of gains and losses
  - Change actuarial cost method to Individual EAN (from Ultimate EAN)
  - Reduce rates of disability and retirement
  - Slightly increase rates of termination
  - Increase administrative expense load from 0.25% of payroll to 0.33% for ERS
    - Lower LECOSRF from 0.10% to 0.08% and JRS2 from 0.50% to 0.33%

Recommendations: Methods

- It is likely that the current actuarial cost method will be deemed unreasonable by the Actuarial Standards Board at some point in the next few years
  - We believe it would be better to not be using it when/if that occurs
  - Changing from ultimate EAN to individual EAN does not materially change the funding period or contribution requirements, mostly impacts our internal processes
- The current asset smoothing method produces undesirable results after a large event such as the 2008 financial crisis
  - Recommend a closed base method, with direct offsetting of gains and losses, to ensure that a large event is fully recognized within a 5 year period, but still eliminate artificial volatility
- Currently, still $2 billion in deferred investment losses (some from 2008) under current smoothing method
- If proposed asset smoothing method had been in place since 2012, there would only be $700 million in deferred losses as of August 31, 2016
- Board also has option to set actuarial (smoothed) value of assets equal to market value (mark to market) on August 31, 2017 and apply smoothing method prospectively

Inflation

- The assumed core inflation rate (currently 3.50% per year) is not used directly in the actuarial valuation, but it impacts the development of:
  - Investment return assumption
  - Salary increase assumptions
  - Overall payroll growth rate
  - Inflation assumption has a different impact on a plan like ERS compared to one that has a regular CPI based COLA
- Held constant in last experience study
- Actual core inflation measured by the CPI-U during:
  - Last 10 years: 1.68%
  - Last 20 years: 2.15%
  - Last 30 years: 2.66%

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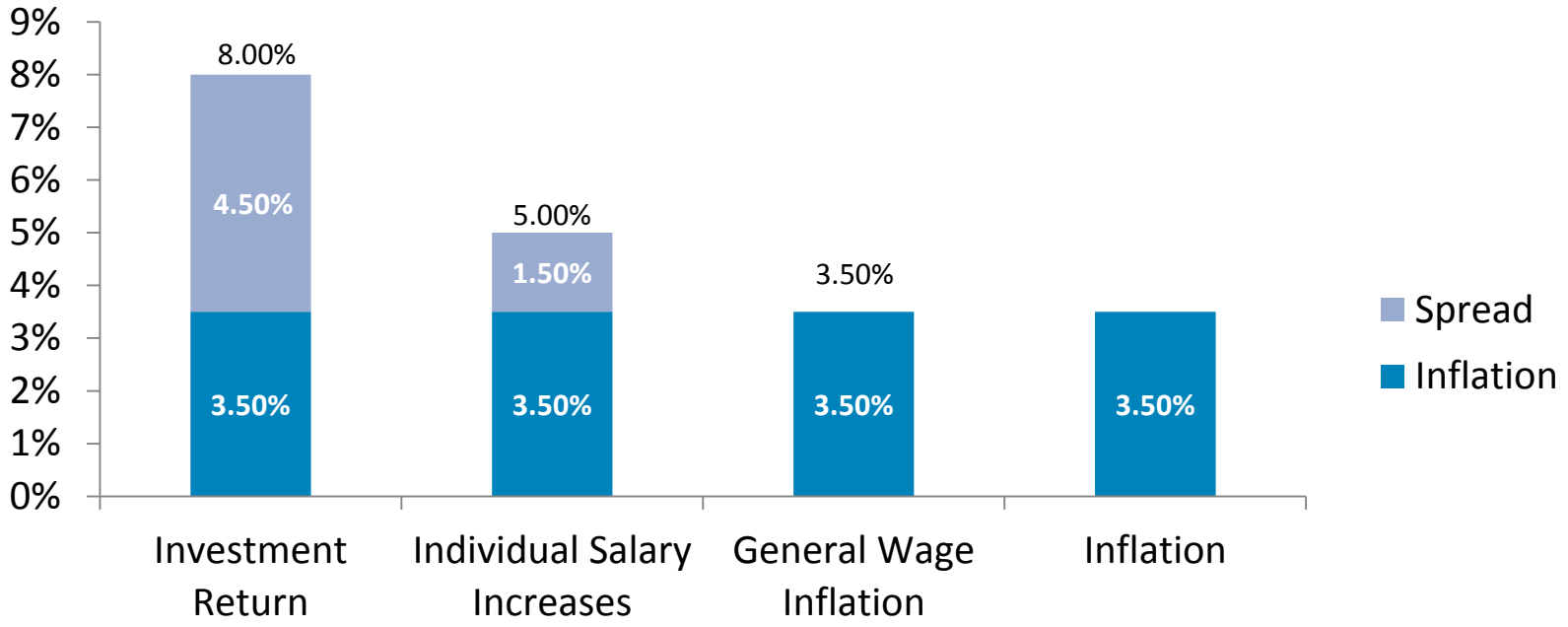
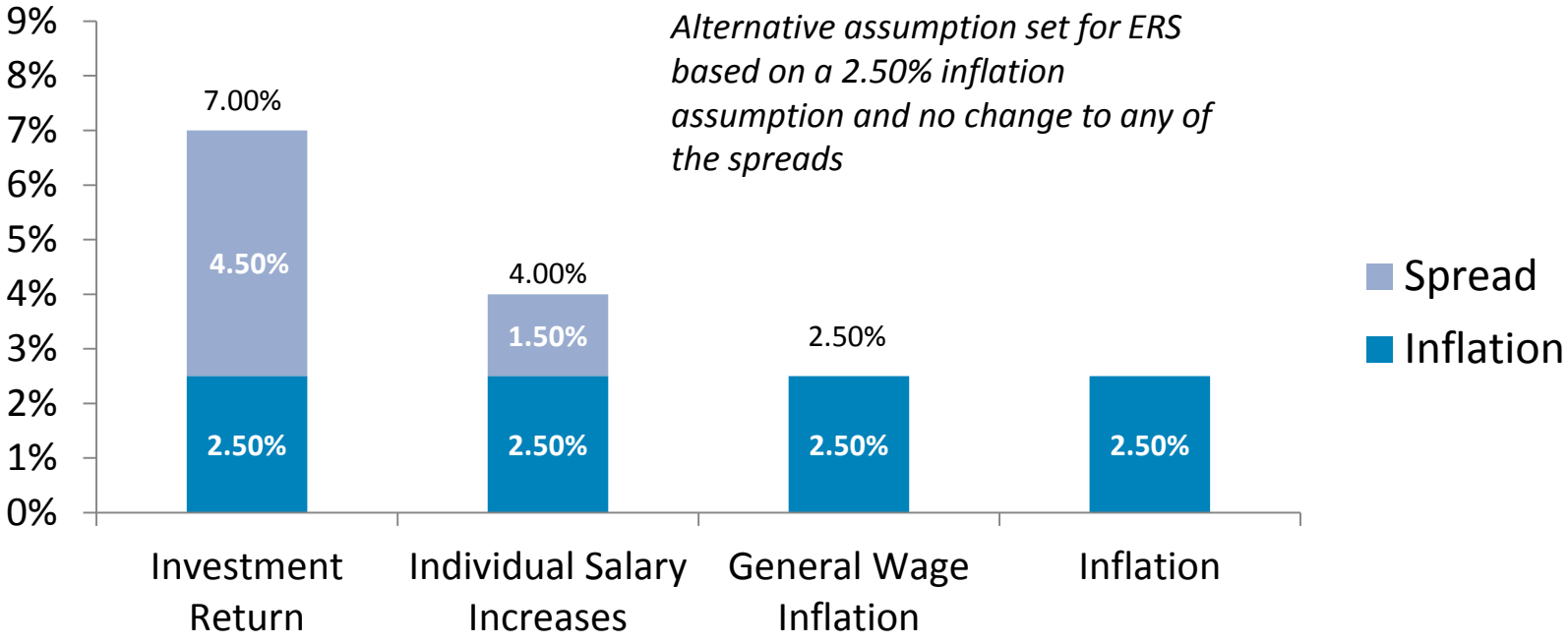
Inflation is the first building block for other economic assumptions



Current Assumption Set for ERS

Decreasing the inflation assumption, by default, lowers the nominal values for the other economic assumptions



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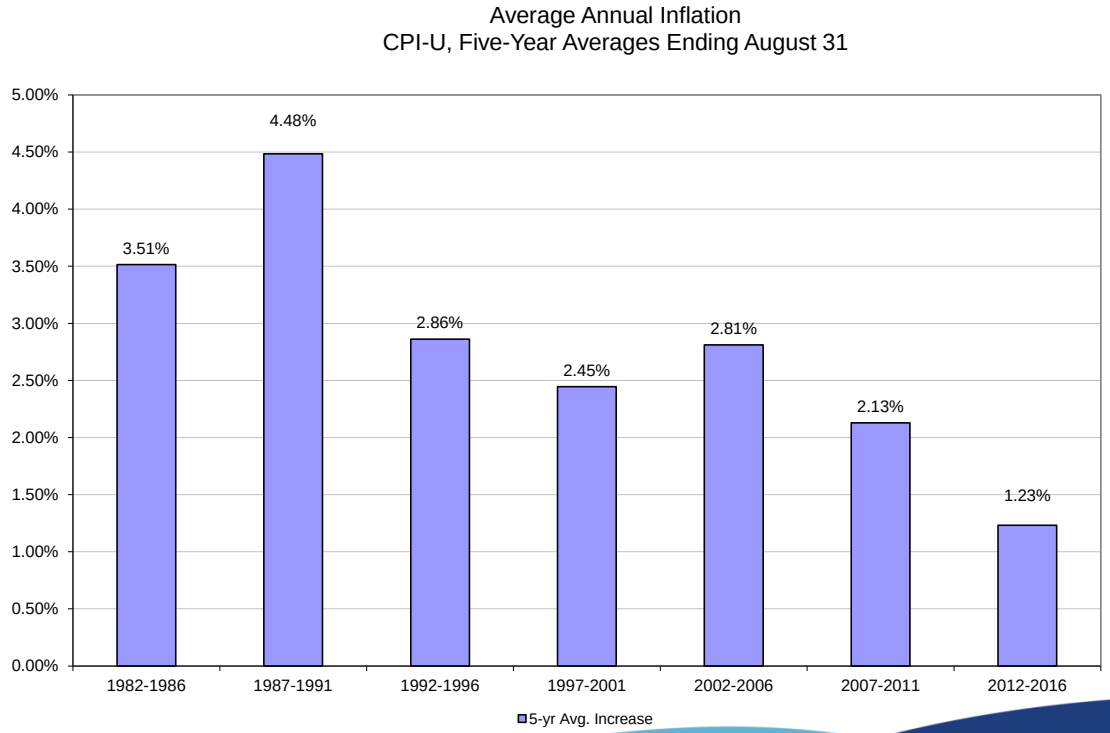
Historical Inflation



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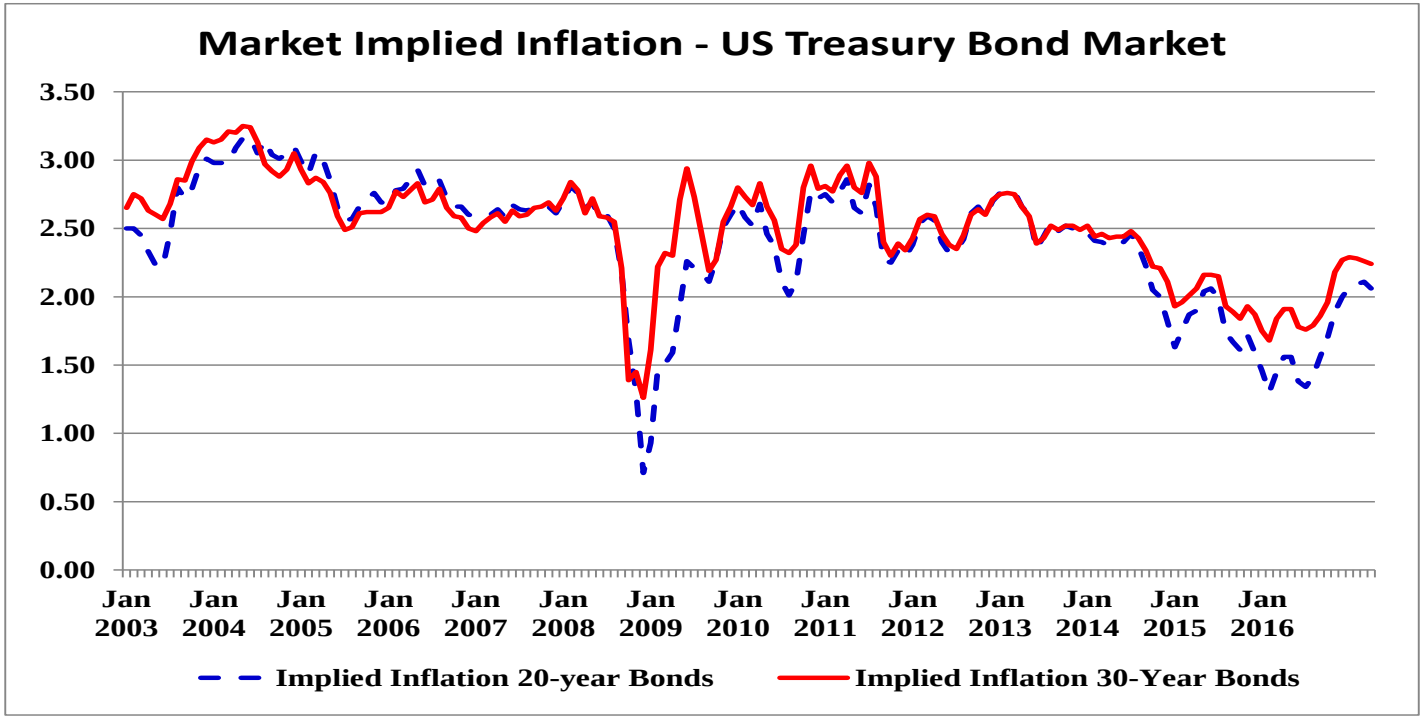
Bond Market Expectations



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Sources (Inflation)

- ERS Investment Staff is using 2.50% in the asset allocation process
- GRS Survey of Investment firms: 2.00% - 2.75%, 2.29% average
- Social Security Trustee's Report: 2.60% (intermediate)
- TIPs vs. Nominal US Treasuries: 2.06% (20 year) - 2.23% (30 year)
- Professional forecasters: 2.30% (10 year)
- Horizon Survey (Summer 2016): 2.16% (10 year) to 2.31% (20 year)

Recommendation (Inflation)

- We are recommending the same 2.50% assumption used the asset allocation process
  - A little higher, but close to most sources
  - Very recent movement in the *"sources"* was to increase this assumption (most increased in last 12 months)
    - For example, the average from the investment firms in our data set increased by 0.10% from 2016 to 2017
  - Several peer systems have recently lowered, but few below 2.50%
  - Reasonable range is 2.20% - 2.50%
- Not a requirement to change in 0.25% increments, however do not want to give the illusion of being too precise

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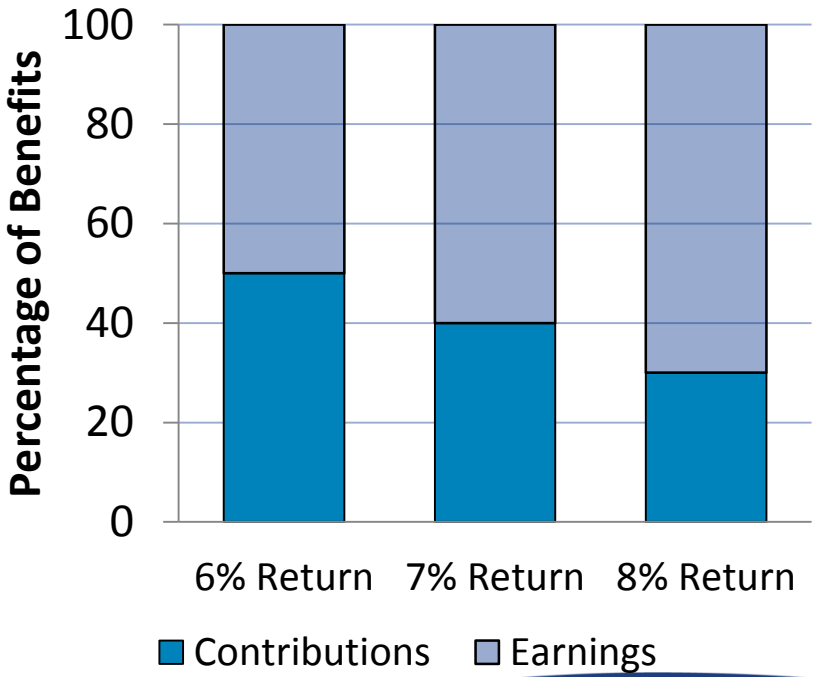
Investment Return Assumption

- This assumption is used to predict what percentage of a future benefit payments will be covered by investment return and what percentage by contributions.
- Lower Returns/Higher Contributions



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Investment Return Assumption

- The assumption selected should be reasonable
  - Not necessarily a single “correct” answer
- Assumption is selected using a process that considers:
  - ERS target asset allocation
  - Capital market expectations
    - Utilize a building block approach that reflects expected inflation, real rates of return, and plan related expenses
    - Take into account the volatility of the expected returns produced by the investment portfolio
- Other factors to consider
  - Historical investment performance
  - Comparison with peers

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Per ASOP 27: Reasonable Assumptions

- An assumption is reasonable if
  - It is appropriate for the purpose of the measurement
  - It reflects the actuary's professional judgement
  - It takes into account historical and current economic data that is relevant as of the measurement date
  - It reflects the actuary's estimate of future experience
  - It has no significant bias (i.e., it is not significantly optimistic or pessimistic)
    - Although some allowance for adverse experience may be appropriate
- The standard explicitly advises an actuary not to give undue weight to recent experience

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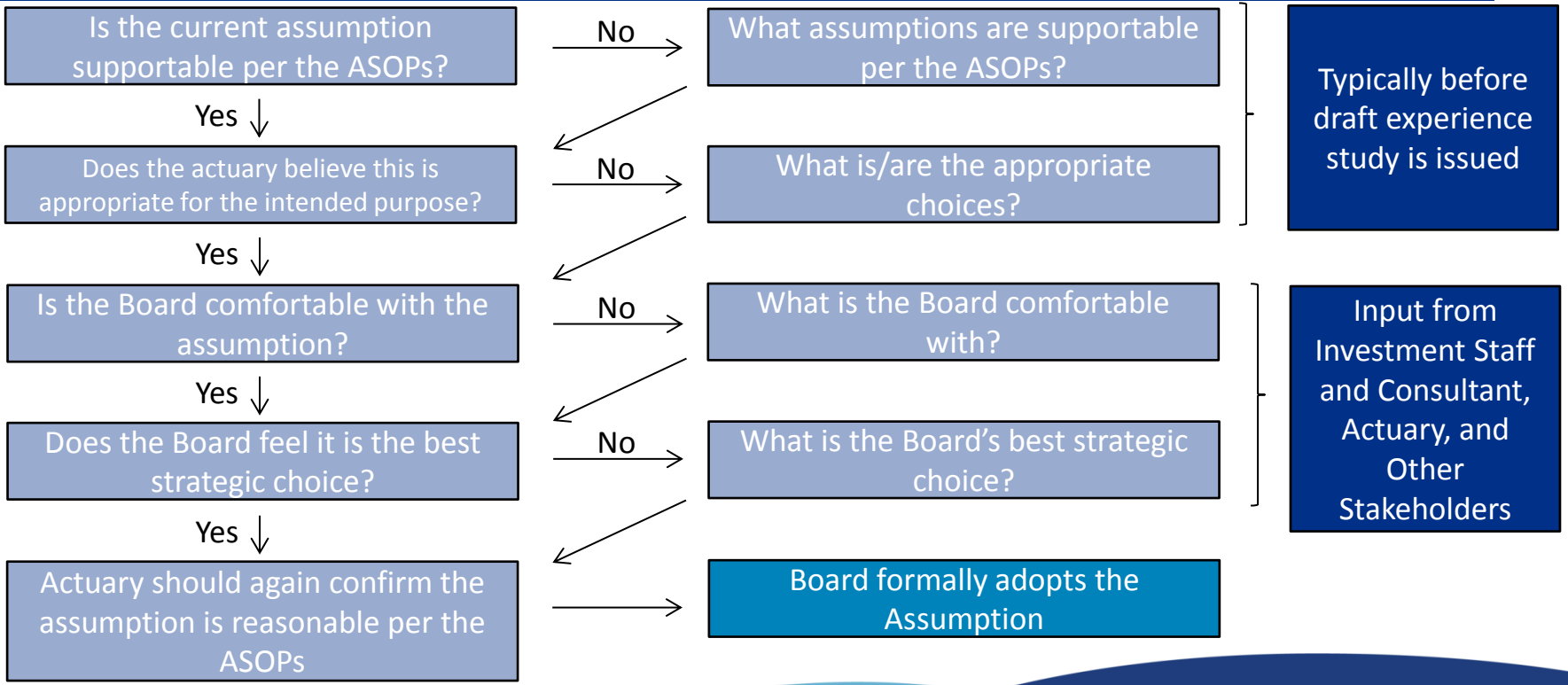
Illustrative Decision Tree



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Historical Volatility Scenarios

- Investment Risk is typically illustrated based on absolute return
  - If the System actually earns 7% over time, the outcome would look like this…..
- However, there is more than that, especially when negative cash flows are introduced
  - Volatility can put a drag on actual asset values
  - Order matters
- To illustrate these other areas of risk, we have prepared illustrative projections using a sample client
  - Scenarios that all achieve an 8% return over a 20 year time horizon
  - However, the scenarios incorporate historical volatility patterns that annualize to 8% returns

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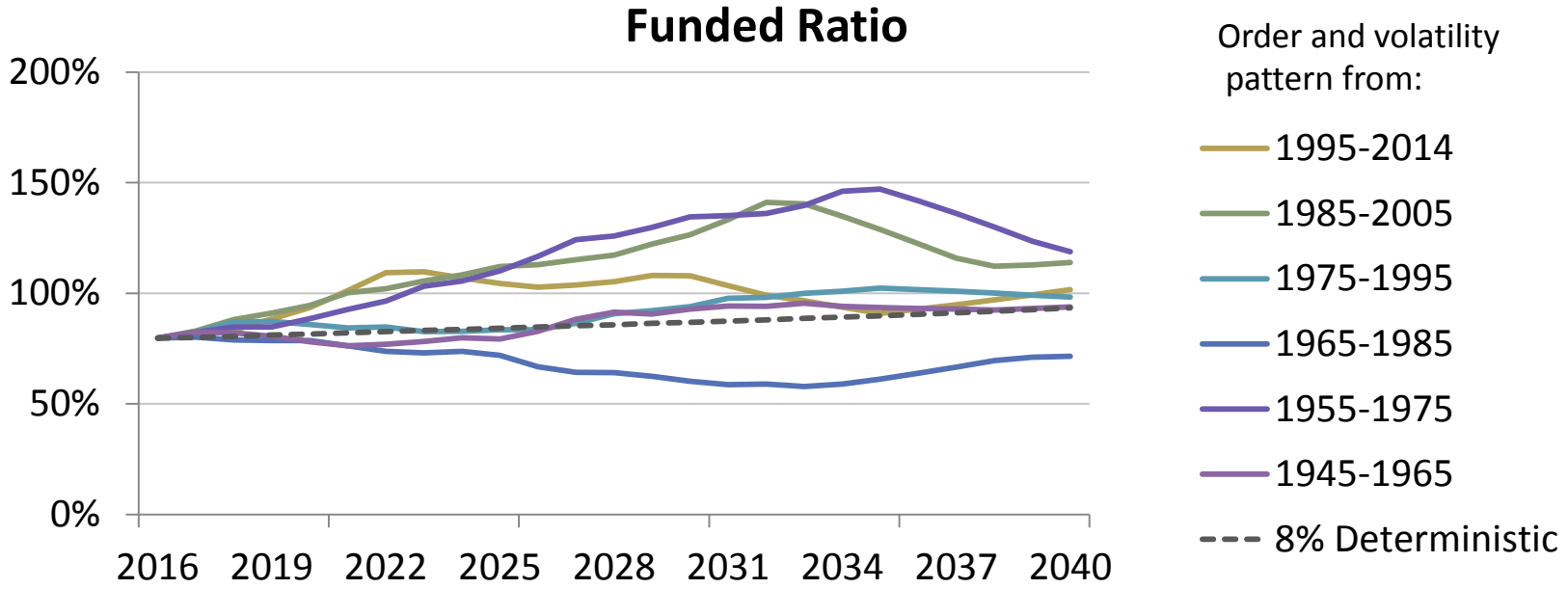
Projection Scenarios Based on Historical Volatility Patterns



The above scenarios all achieve an 8% compound return over a 20 year period. Actual returns each year are based on the actual historical pattern during the range provided, with an overall adjustment to achieve an 8% return.

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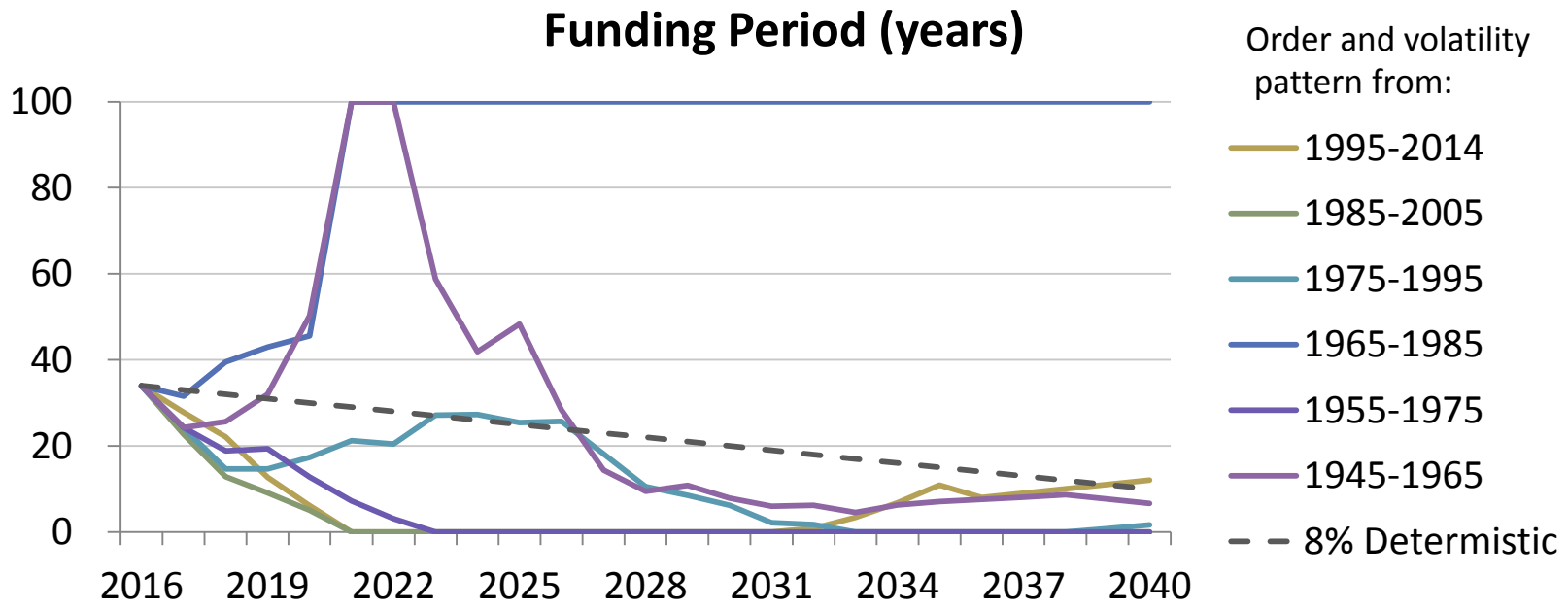
Projection Scenarios Based on Historical Volatility Patterns



The above scenarios all achieve an 8% compound return over a 20 year period. Actual returns each year are based on the actual historical pattern during the range provided, with an overall adjustment to achieve an 8% return.

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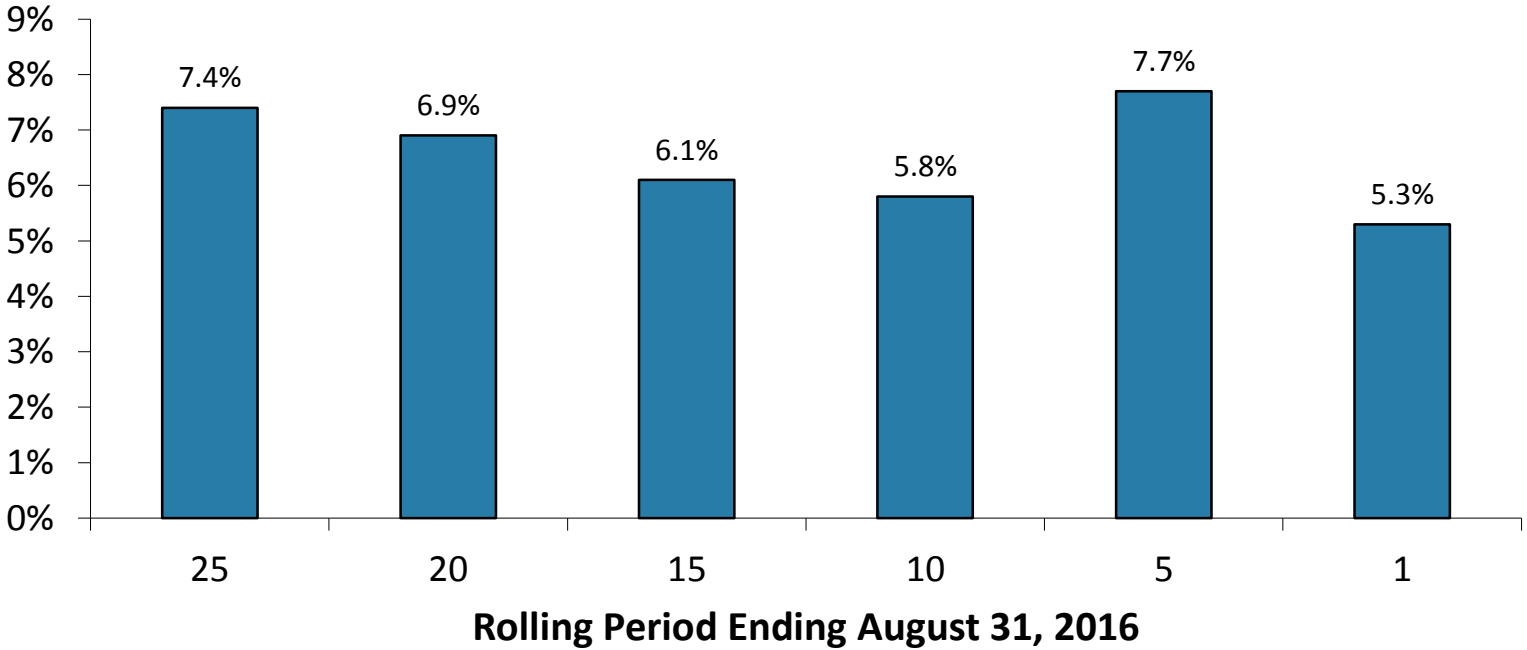
Historical Volatility Scenarios

- Takeaway:
  - Without cash flows, order doesn't matter when compounding returns
  - With cash flows, ORDER MATTERS!
  - Benefits will be paid with trust assets (dollars), not returns
  - Two scenarios can have the same "return" and produce very different ending asset values
  - Not enough to just say, we are "long term" investors, must also pay attention to the shorter to intermediate term

Annualized Yields Based on Market Value of Assets



Based on historical information prepared by Aon

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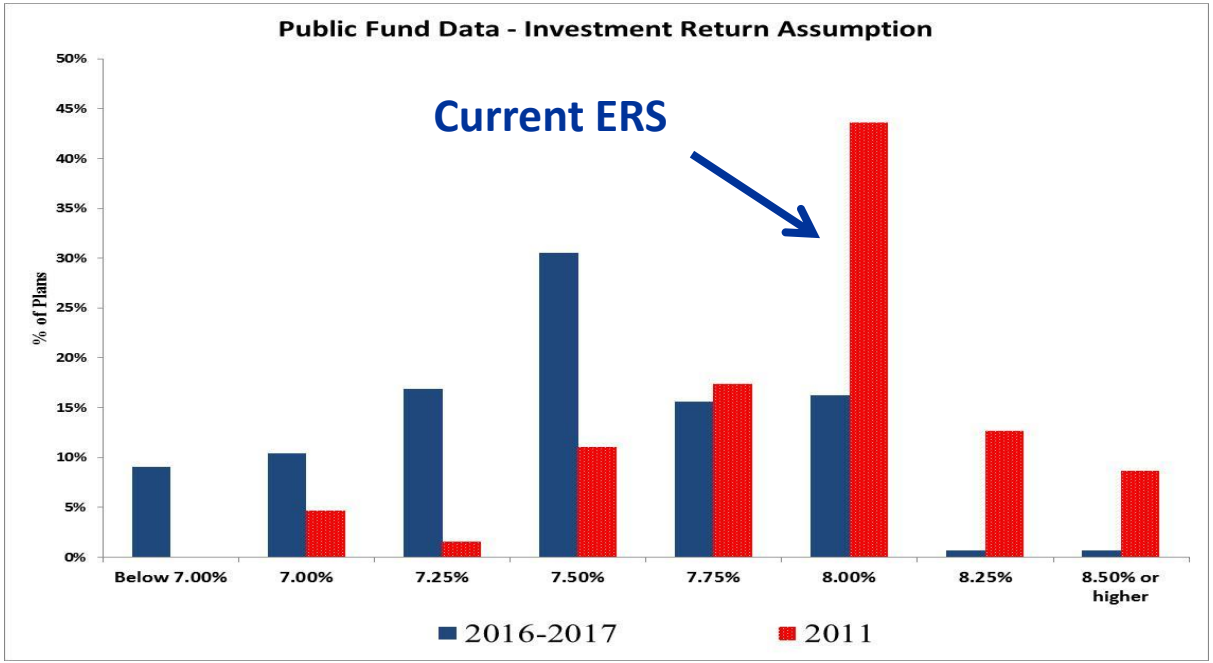
Investment Return Assumption

Comparison to Peers



Source: 2017 Public Plans Database

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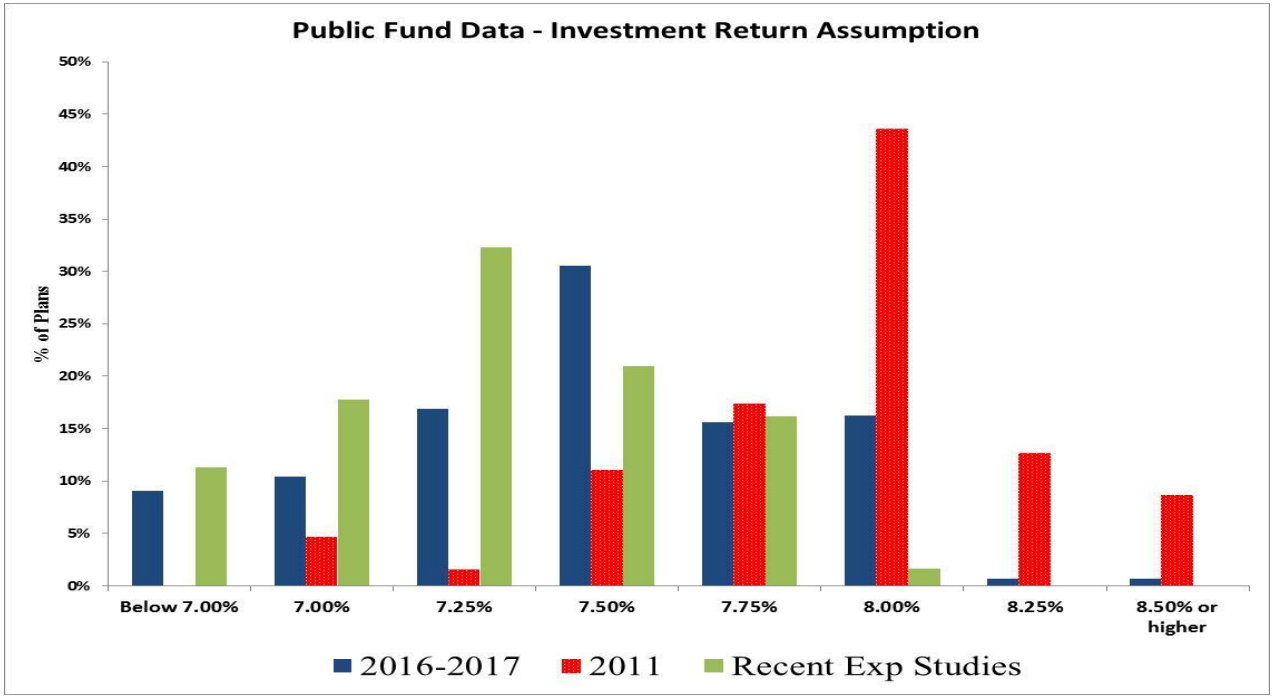
Investment Return Assumption

Comparison to Peers



"Recent Exp Studies" is the compilation from Systems that have performed experience studies in the last 24 months

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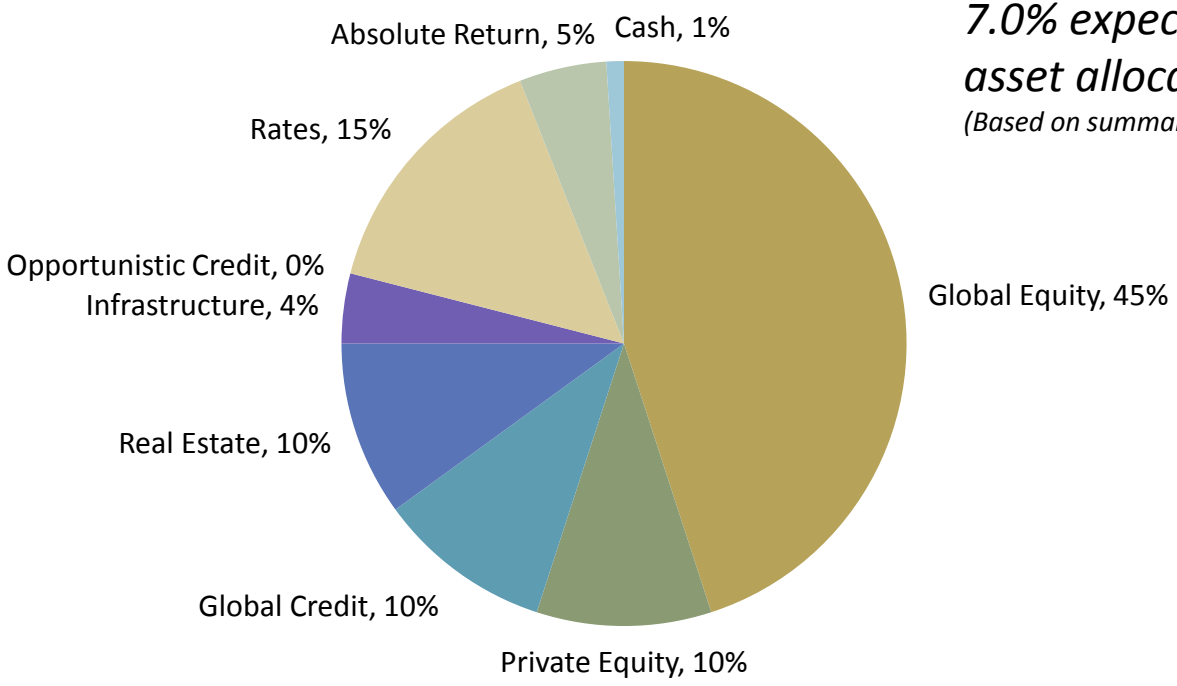
Current Target Portfolio



7.0% expected return per asset allocation study

(Based on summaries prepared by Aon)

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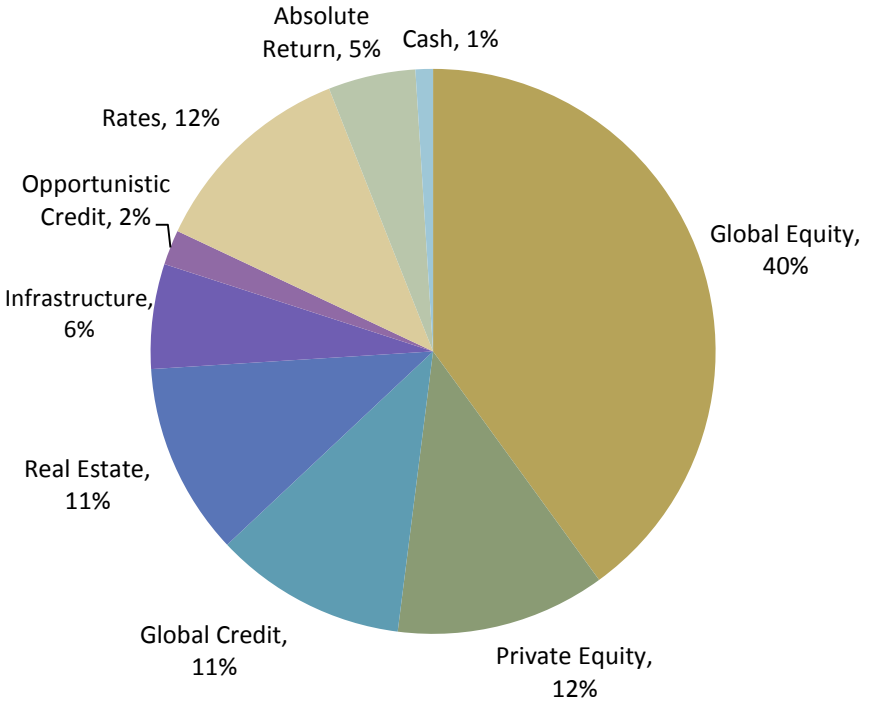
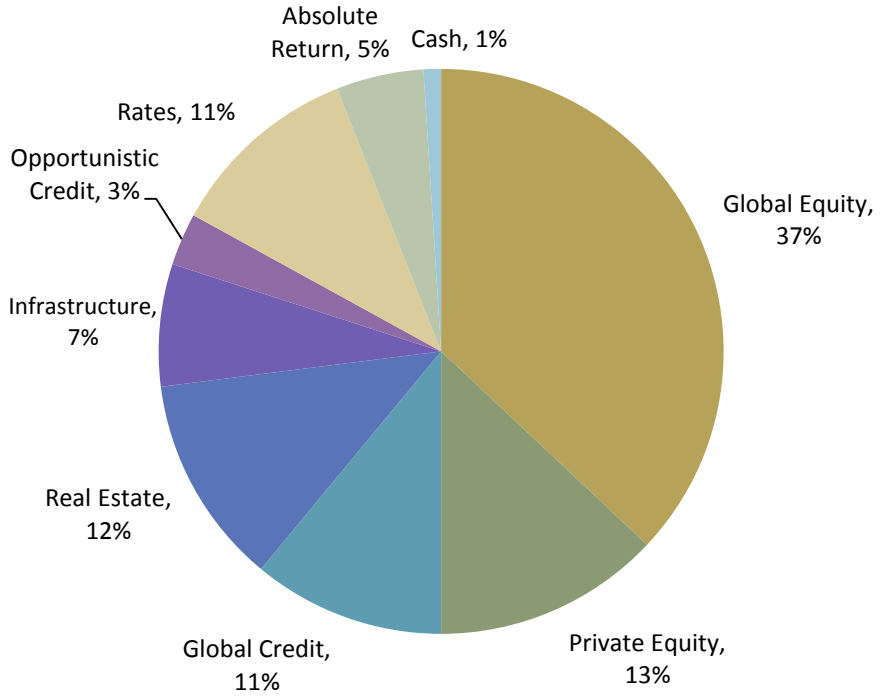
Proposed Target Portfolios



Diversified
7.1% Expected Return per AAS



Enhanced Return
7.2% Expected Return per AAS

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Capital Market Assumptions – Investment Consultants

- We performed the analysis on the two proposed asset allocations
- Projected real returns were developed using ERS's target investment allocations and 2017 capital market return assumptions developed by eleven investment consulting firms:
  - 7 have 7-10 year time horizons
    - Average expected inflation of 2.28%
  - 4 have 20+ year time horizons
    - Average expected inflation of 2.29%
  - Horizon survey of 29 firms with 5-20+ year time horizons
    - From before the election
- This process typically has a "mapping bias", meaning asset classes always don't map one-to-one, and the industry average will typically underestimate the expected returns when compared to the individual System's consultant

Distribution of Expected Returns (Nominal)

- Enhanced return portfolio
- Nominal return comparisons
- 7-10 year time horizons
- Average Expected Real Return of 4.27%
- ***Based on each individual consultants' inflation assumption, average 2.28%***

Investment Consultant	Distribution of 10-Year Average Geometric Net Nominal Return			Probability of exceeding	Probability of exceeding	Probability of exceeding
	40th	50th	60th	8.00%	7.25%	7.00%
(1)	(2)	(3)	(4)	(5)	(6)	(6)
1	5.1%	6.0%	6.8%	27.8%	30.0%	33.6%
2	5.7%	6.5%	7.3%	32.1%	36.9%	41.1%
3	5.2%	6.2%	7.2%	32.9%	35.9%	39.2%
4	5.4%	6.4%	7.4%	34.3%	38.0%	41.5%
5	5.5%	6.6%	7.7%	37.8%	42.1%	45.2%
6	5.7%	6.7%	7.8%	38.2%	43.2%	46.5%
7	6.6%	7.4%	8.1%	41.7%	52.5%	57.3%
Average	**5.61%**	**6.55%**	**7.50%**	**35.0%**	**39.8%**	**43.5%**

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Range of Expected Returns

	Current	Diversified	Enhanced Return
ERS Asset Allocation Study	7.0%	7.1%	7.2%
10 year survey – Nominal	6.48%	6.53%	6.55%
20+ year survey – Nominal	7.00%	7.02%	7.02%
10 year survey – Real with 2.5% inflation	6.70%	6.75%	6.77%
20+ year survey – Real with 2.5% inflation	**7.21%**	**7.23%**	**7.23%**
Horizons Survey (10 year) Nominal	6.78%	6.89%	6.93%
Horizons survey (10 year) – Real with 2.5% inflation	7.08%	7.19%	7.23%

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Time Horizon

- Several of the sets of capital market assumptions provided by the investment consultants have 5-10 year time horizons
- The average duration of the System is ~20 years
  - This is the amount of time until the average interest-discounted benefit payment will be made on an open group basis
- Using Treasury yields: The average expected mean is made up of the risk-free rate and a risk premium
  - The 10-year zero coupon US Treasury yield is currently 2.35%
  - The 20-year zero coupon US Treasury yield is currently 2.85%
  - The difference in the yield curve from “10 to 20” is “2.85% less 2.35%” which equals 0.50%
- We believe this validates the approximate 0.50% difference in the surveys based on time horizon

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Distribution of Expected Returns

Longer Time Horizon and Inflation Adjustment

- Enhanced return portfolio
- Real return plus 2.50% comparisons
- 15-20+ year time horizons
- Average Expected Real Return of 4.73%
- *Based on proposed inflation assumption of 2.50%*

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 8.00%	Probability of exceeding 7.25%	Probability of exceeding 7.00%
	40th	50th	60th			
(1)	(2)	(3)	(4)	(5)	(5)	(5)
1	7.54%	6.89%	6.25%	33.25%	44.42%	48.31%
2	7.77%	7.10%	6.43%	36.69%	47.68%	51.44%
3	8.01%	7.30%	6.60%	40.09%	50.71%	54.30%
4	8.37%	7.62%	6.88%	44.90%	55.02%	58.37%
Average	**7.92%**	**7.23%**	**6.54%**	**38.73%**	**49.46%**	**53.11%**

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Actuary's Recommendation

- Based on either proposed portfolio, GRS recommends decreasing the current investment return assumption from 8.00% to no higher than 7.25%
  - 7.25% is close to the expected return in the asset allocation study in our survey over a longer time horizon and with the 2.50% inflation assumption
  - If the Board is uncomfortable increasing the real return assumption, should consider 7.00%
  - If the Board is uncomfortable with approximate 50% probability achieving assumption over the longer term, should consider 7.00%
  - If the Board is uncomfortable with much lower probability achieving assumption over the shorter term, should consider 7.00%
  - If the Board feels the likelihood of having to eventually decrease to 7.00% in a future experience study is high, should consider 7.00% now

	Current	Recommended @7.25%	Consideration @7.00%
Inflation	3.50%	2.50%	2.50%
Real Return	4.50%	4.75%	4.50%
Nominal Return	**8.00%**	**7.25%**	**7.00%**

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Wage Assumptions

- Building block approach to assumptions for projecting wages
  - Should be consistent and tied to inflation
  - General Wage Inflation (GWI): Core Inflation plus increases in Productivity
  - Individual Salary Scale: Core Inflation plus Productivity plus Individual Merit, Promotion, and Steps
    - 3.50% + 1.50% (Regular EEs) = 5.00% Ultimate Salary Increase Assumption after 30 years of service
    - 5.90% average increase over member's career

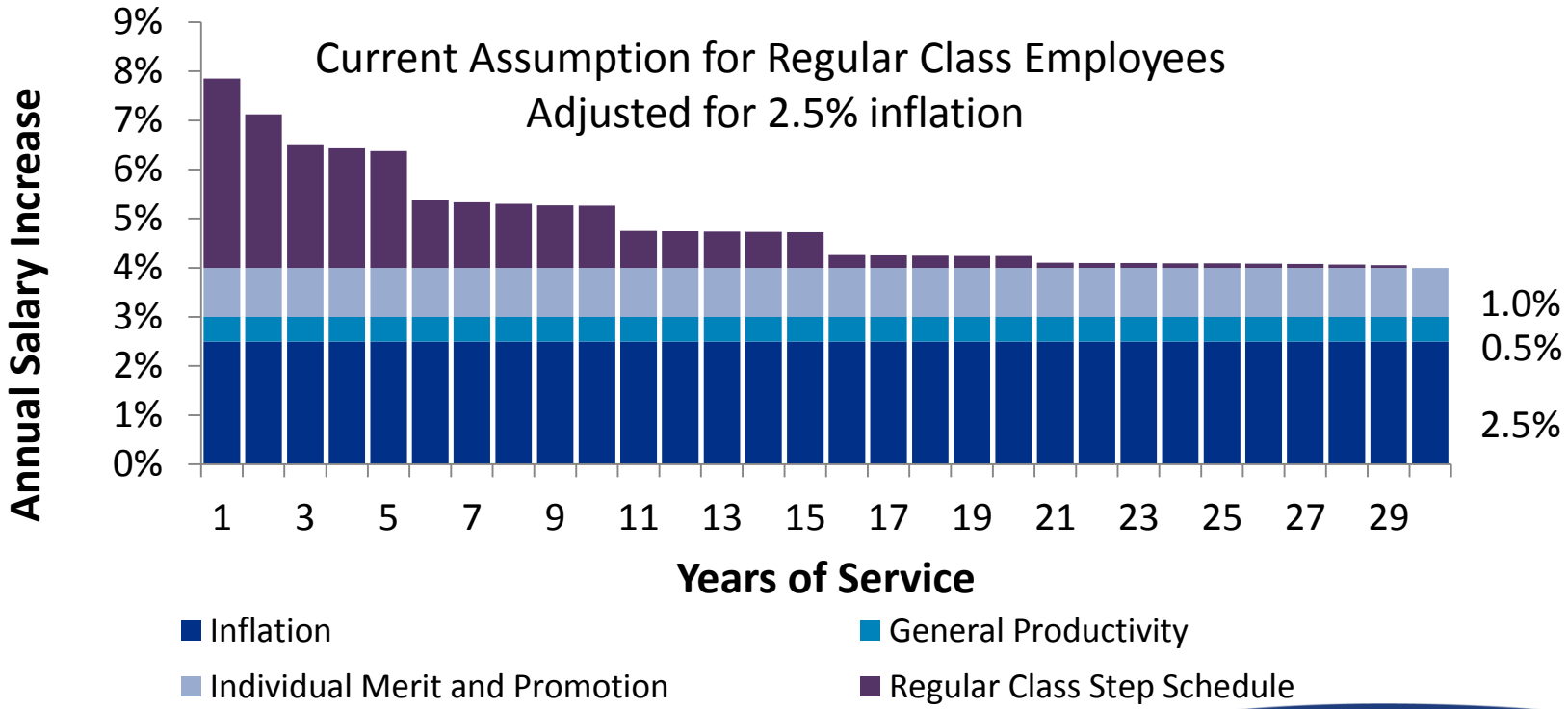
General Wage Inflation (GWI)

- Under Individual EAN, will be used to index the pay for each new group of new entrants in the open group projection used to determine the funding period
- Could be viewed as “the change in average salary for the group”
  - Similar to the National Average Wage statistic (NAW)
- Over last 20 years, the average salary for an ERS member has increased 3.0% per year, 2.9% over last 10
- Over last 20 years, the average NAW has changed 3.4% per year, 2.7% over last 10
- Over the past 10 years, the average salary for an ERS member with less than 5 years of service has changed 2.5% per year
- The last 10 years especially have been a low inflation environment, which would put a downward bias in the rates of increase
- The last 10 – 20 years has had an aging bias in the national and ERS populations, which would put an upward bias in the rates of increase
- We recommend 3.0% per year GWI assumption (0.5% + inflation)

Individual Salary Increases

- Used to project future benefits
- Core Inflation plus Productivity plus Individual Merit, Promotion, and Steps
- Implicitly reflects all of the following:
  - Across-the-board increases for all employees;
  - Across-the-board increases for a given group of employees;
  - Increases to a minimum salary schedule;
  - Additional pay for additional duties;
  - Step or service-related increases;
  - Increases for acquisition of advanced degrees or specialized training;
  - Promotions;
  - Overtime, if applicable;
  - Bonuses, if available; or
  - Merit increases, if available

Structure of Assumptions for Individuals



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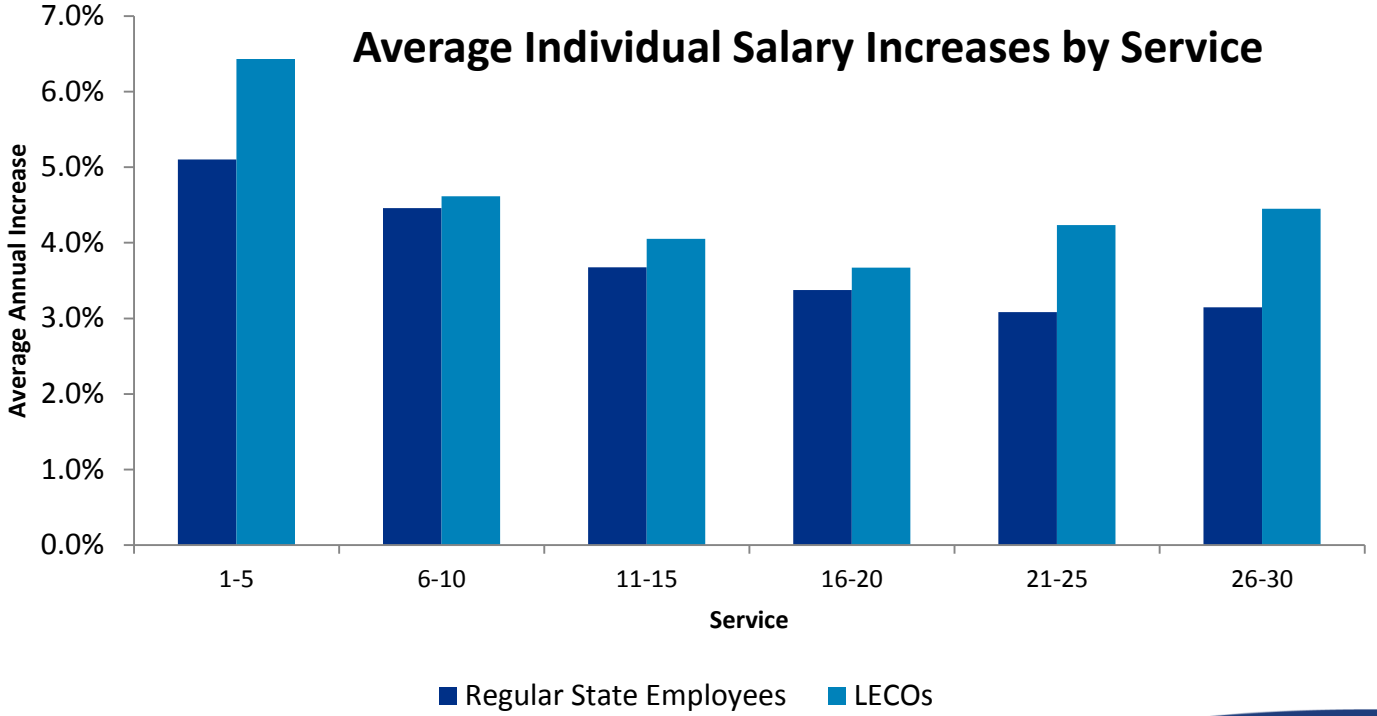
ERS Member-Specific Experience for Last 5 Years



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ERS Member-Specific Experience for Long Service

- Overall, current nominal assumptions have been lower than expected
- However, due to very low inflation, the increases *above inflation* have been higher than expected (real)
  - Especially so for LECOs

Long Service Individual Salary Scale (5-Year Experience)			
	Regular State Employees	LECOs	Judges
Current Assumption	5.00%	5.00%	3.50%
Less Assumed Inflation	3.50%	3.50%	3.50%
Assumed Productivity/Merit/Promotion above Inflation	1.50%	1.50%	0.00%
Actual Nominal Experience	3.28%	3.84%	2.51%*
Less Actual Inflation	1.23%	1.23%	2.24%*
Actual Productivity Above Inflation for last 5 Years	2.05%	2.61%	0.27%*

* Experience based on 20 year history of pay for District court judge

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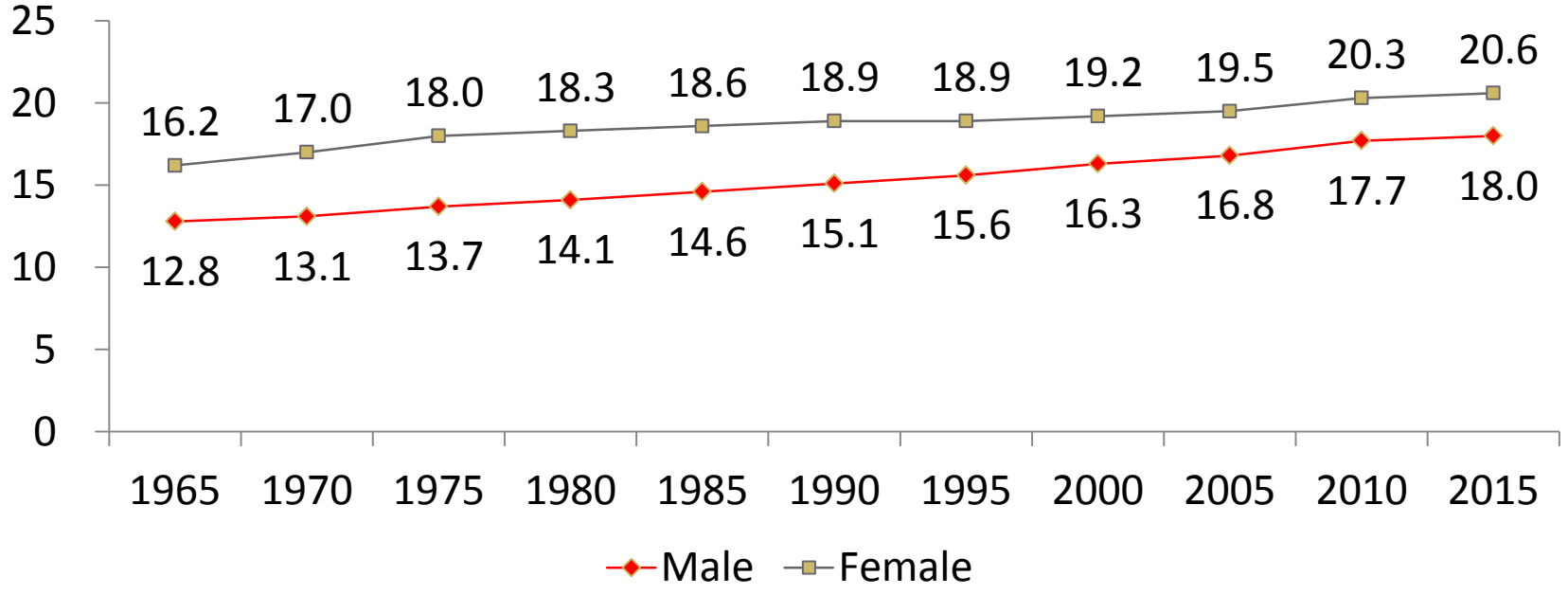
Recommendation

- Being an economic assumption, short term trends do not necessarily reflect long term expectations
- We typically like to have 10 years of reconciled experience to make a significant change to the step-rate or merit assumptions
- For regular State employees, we are reducing the entire schedule by the 1% change in the underlying inflation assumption, but making no other changes
  - Nominal assumption for long service members decreasing from 5.0% to 4.0%
- For LECOs, we are increasing the individual merit component by 0.5% and extending out the step portion from 10 to 20 years
  - Nominal assumption for long service members decreasing from 5.0% to 4.5%

Post-retirement mortality

- Nationally, life expectancies continue to improve
- This assumption was materially changed in the 2008 experience study, with built-in continuous improvement
  - Generational mortality based on Scale AA
  - ERS was a very early adopter of this approach
- The assumption was only slightly modified in the 2013 experience study
- There has been a significant amount of activity on this assumption in the industry with new tables published as of 2014 (RP-2014), along with four sets of improvement scales
  - Improvement Scale BB, MP-14, MP-15, and MP-16

Life Expectancy for the General US Population - from Age 65



Source: National Vital Statistics Reports

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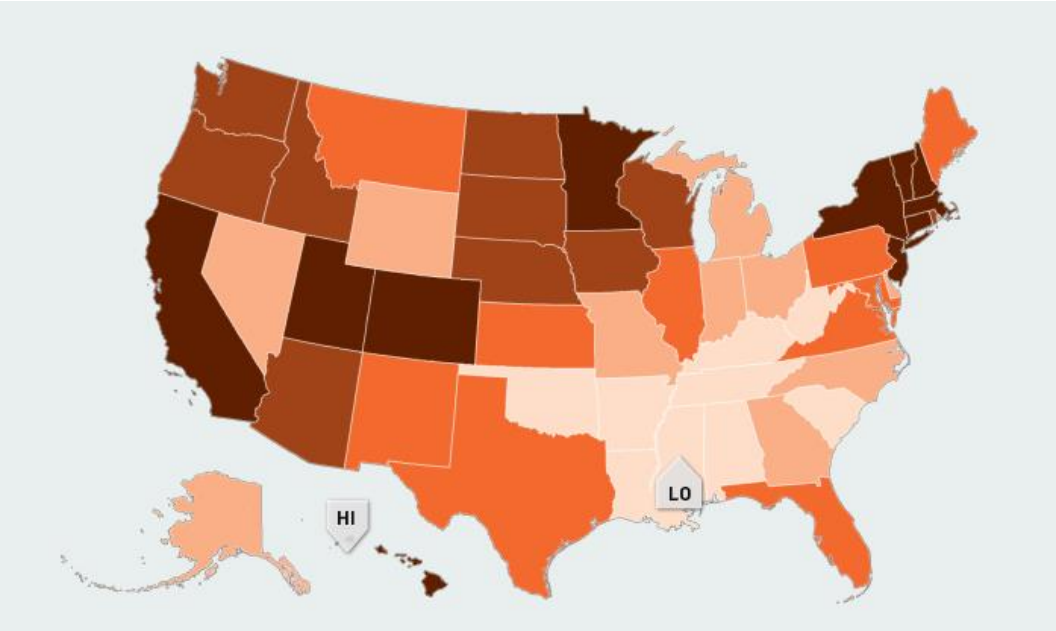
Post-retirement mortality

- In setting the longevity assumption, the actuary must make two decisions:
  - How long are annuitants currently living?
    - Heavily dependent on actual data
  - What improvement in longevity is expected in the future?
    - Heavily dependent on the underlying *trends* in the data, as well as more subjective decisions
- We already use a generational approach to this assumption
  - Assumption that life expectancy will continue to improve in the future
- The amount of data dictates how much credibility the actuary can apply to the results
  - ERS has full credibility for determining current longevity, but less credibility for determining future rates of improvement

Life Expectancy by State



Legend: 80.0–81.3 | 79.5–80.0 | 78.4–79.5 | 77.2–78.4 | 75.0–77.2

Data from National Vital Statistics

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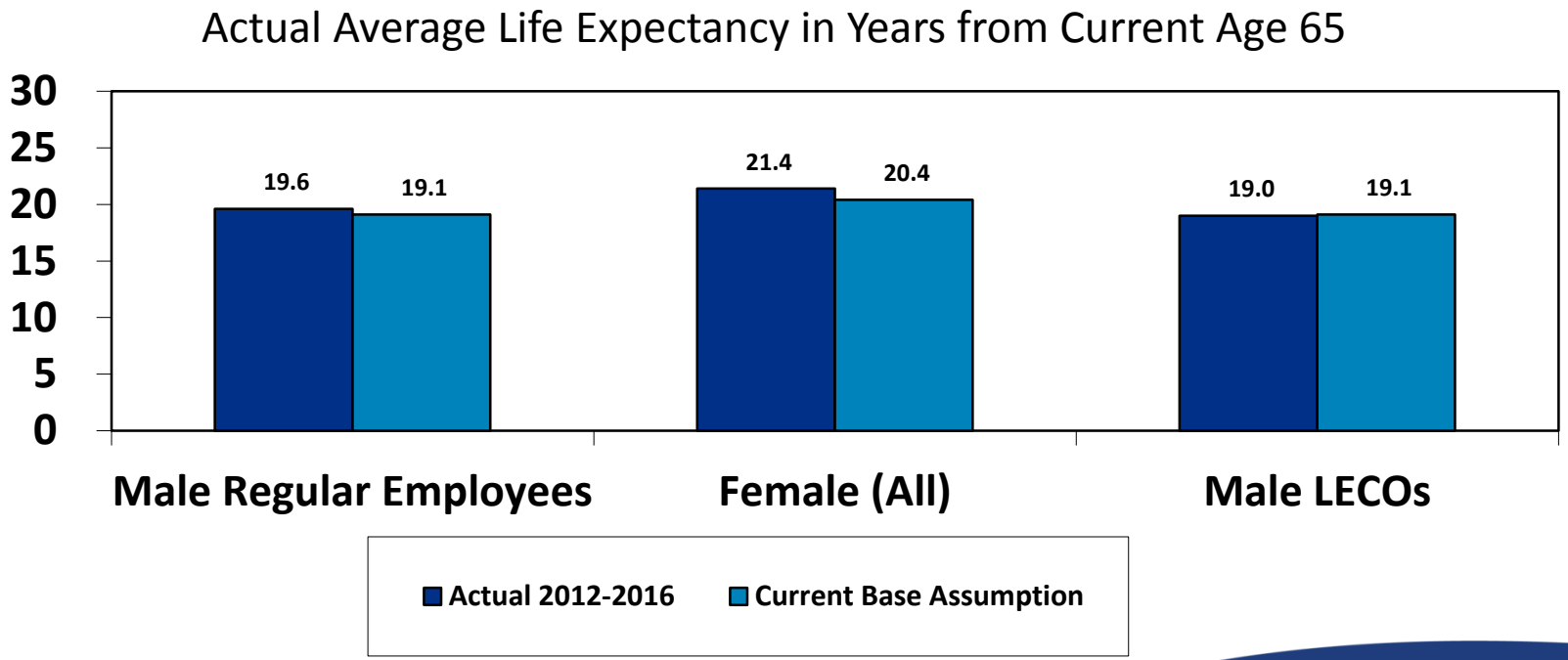
Post Retirement Mortality



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Options for post-retirement mortality assumptions

Current Life Expectancy	Future Improvement in Life Expectancy
RP 2014 Tables:	Very High (MP-2014)
High (White Collar adjustments)	High (Scale BB, MP-2015)
Medium (No Collar adjustment)	Medium (Ultimate MP, MP-2016)
Low (Blue Collar adjustments)	Low (Scale AA)
Variant of one of the above	Custom Scale
Custom table based on plan experience	

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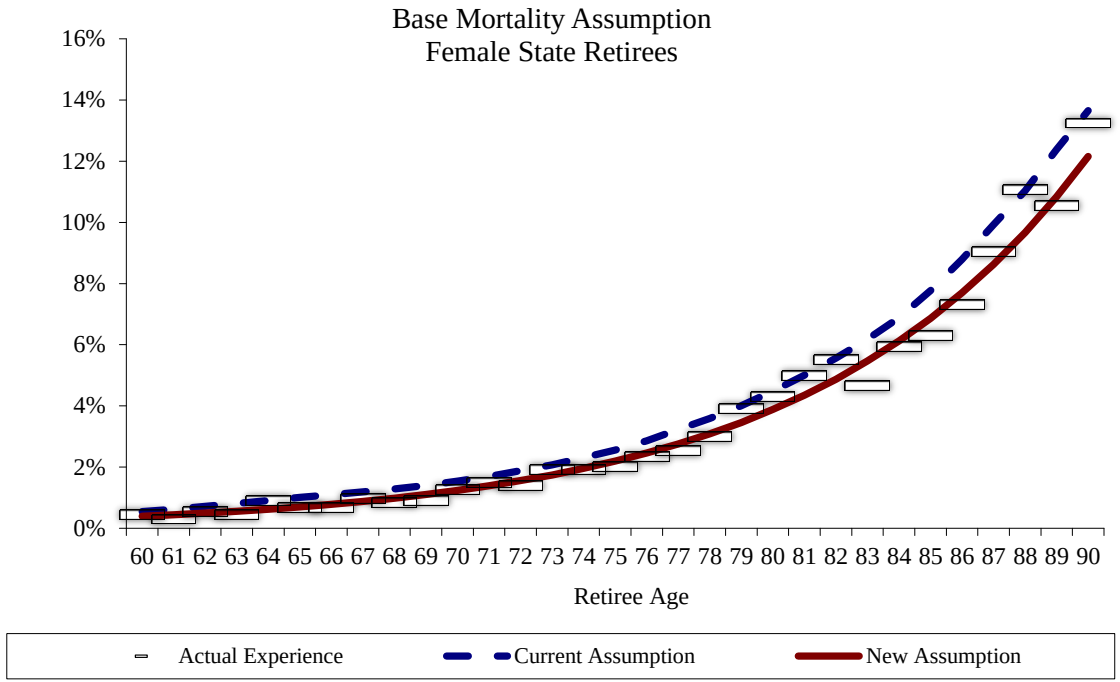
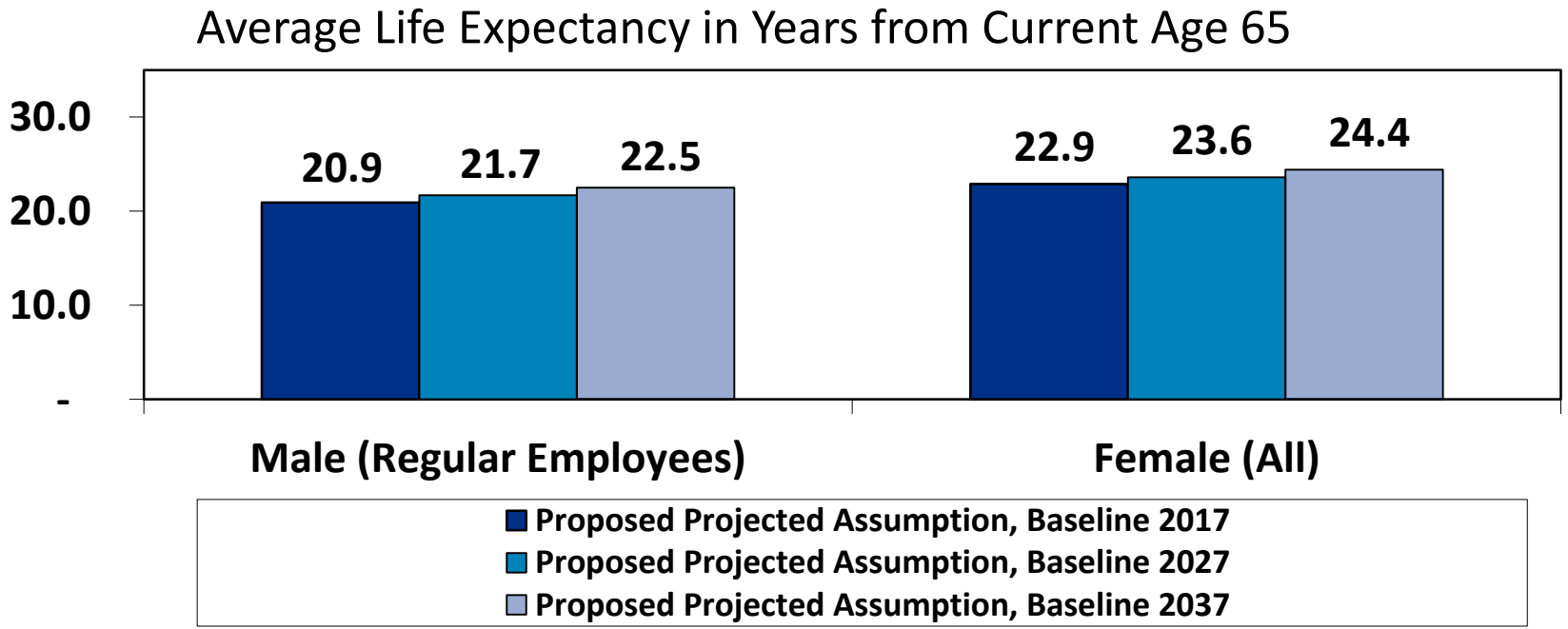
Post-retirement Mortality – Base Table

- Recommend a base mortality table developed using ERS experience
  - 2017 State Retirees of Texas (2017 SRT)
  - Separate tables for males and females
  - For LECOs, will make an adjustment to reflect slightly impaired mortality for males
- We are recommending ERS continue to use a fully generational approach to project future mortality improvement
  - With this fully generational projection approach, a gradual and consistent improvement over time would be incorporated into the valuation process
  - Greatly diminishes the risk of having to have another large update to mortality in a future experience study
- For the projected improvement assumption, we are recommending the ultimate rates of the most recently published improvement scales
  - Ultimate MP improvement rates (medium, don't change annually)

New Base Tables



Proposed Life Expectancies



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Other Demographic Assumptions and Methods

- Most other changes were less significant, simplifications or adjusting a method to better fit GRS software processes
- As we are already on page 55, we will not go into detail on these but can answer any questions

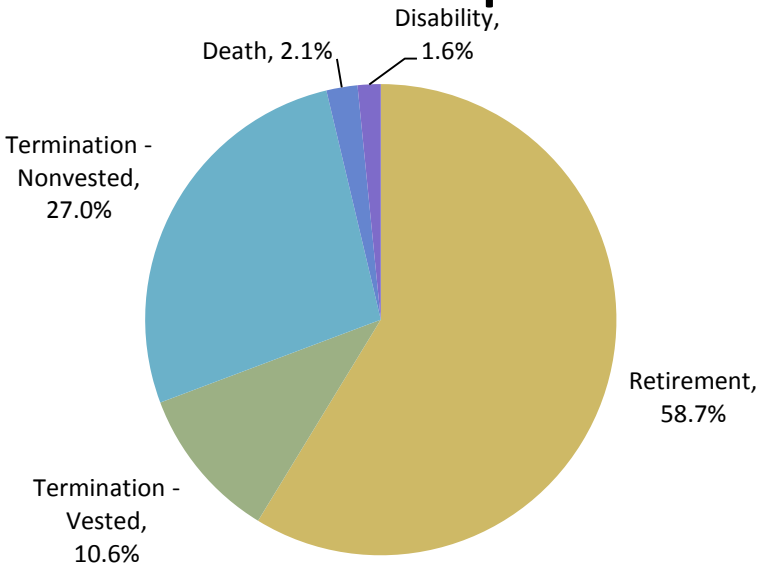
Recommendations from Actuarial Audit Regarding Assumptions

- Complete experience study, and consider
  - Lower discount rate
  - Lower expected inflation assumption
  - Update retirement assumptions
  - Update mortality assumptions to current, pension plan related mortality experience and mortality improvement
  - Revise mortality assumption for employees to reflect significantly lower mortality than that for retirees
- Add mortality improvement assumption to disability mortality assumptions

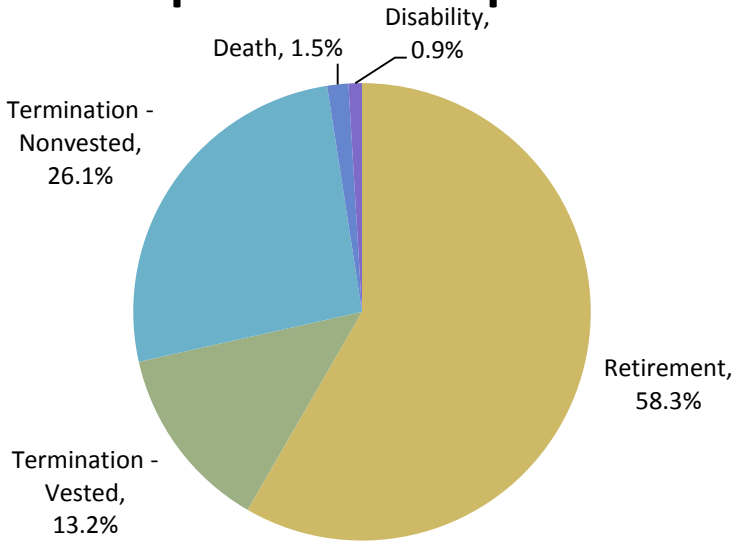
Current Membership

Percentage of Current Membership Expected to Leave Active Service Due to:

Current Assumptions



Proposed Assumptions



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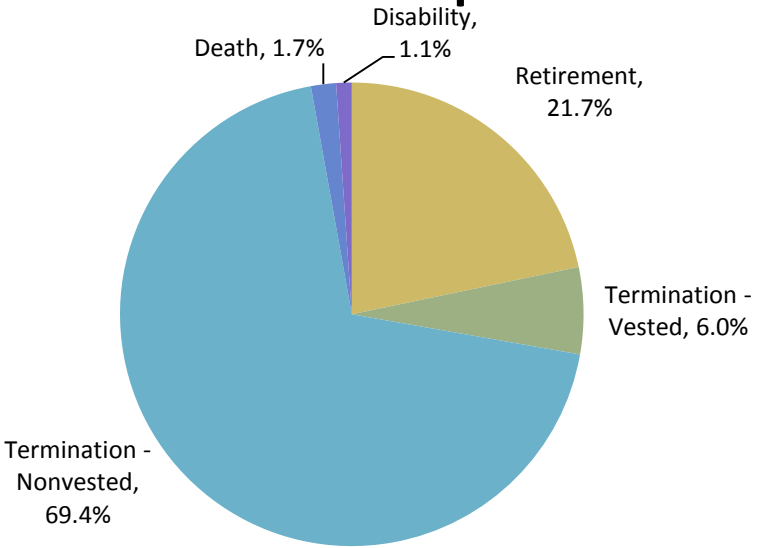
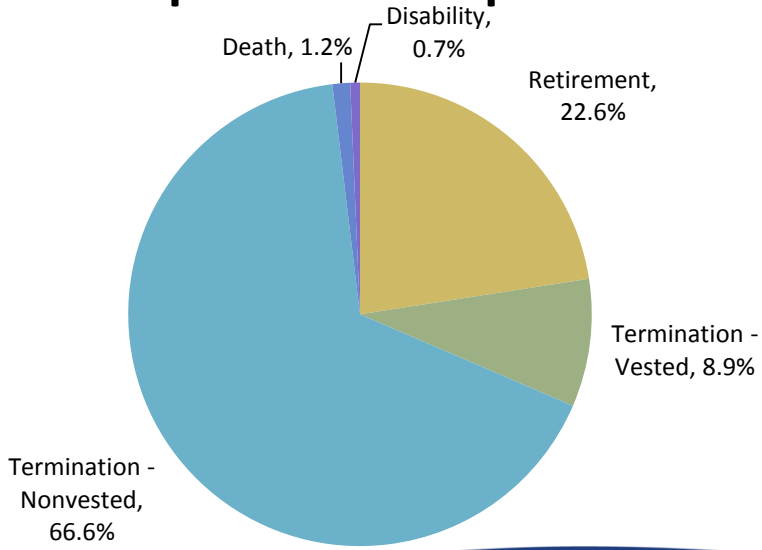
New Entrants

Percentage of Future Members Expected to Leave Active Service Due to:

Current Assumptions



Proposed Assumptions



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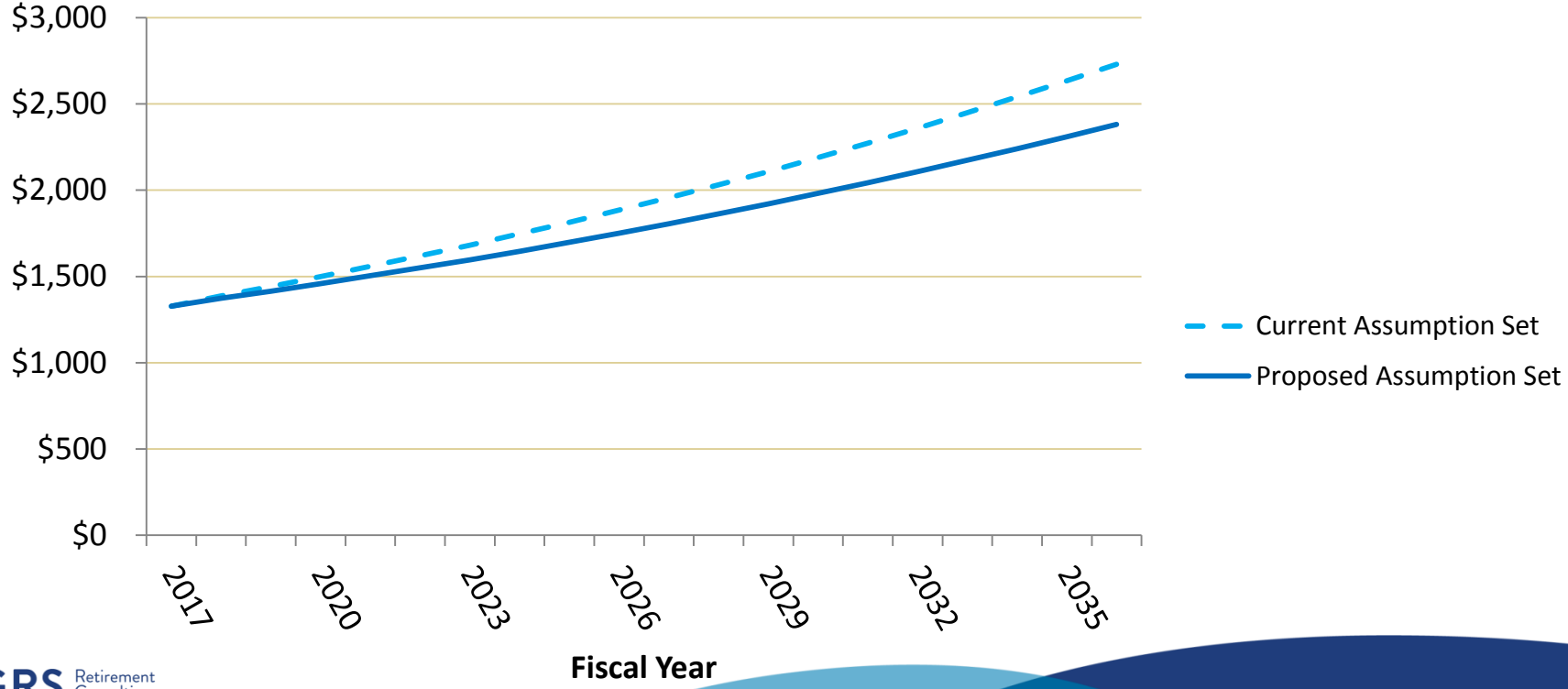
Projected Contributions, in millions
Current Rates



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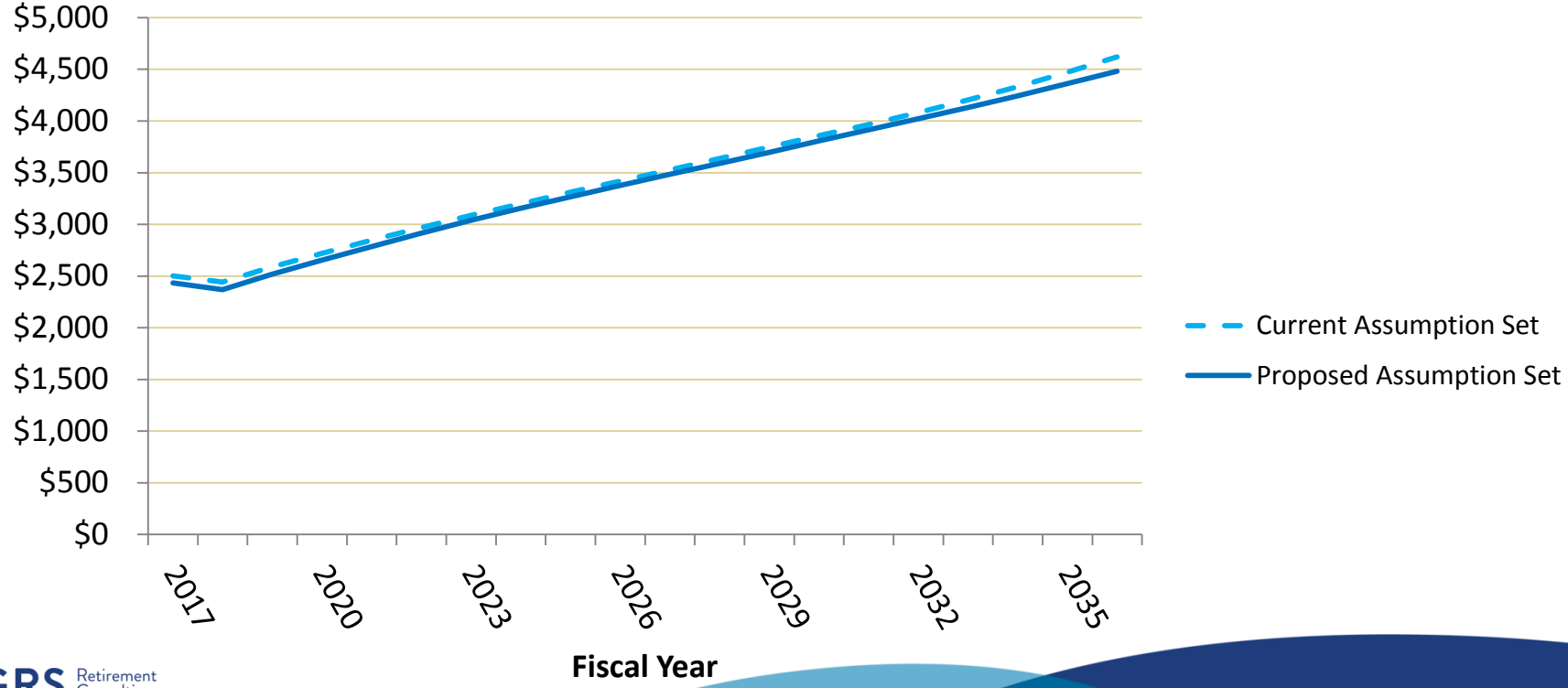
Projected Benefit Payments, in millions
Current Rates



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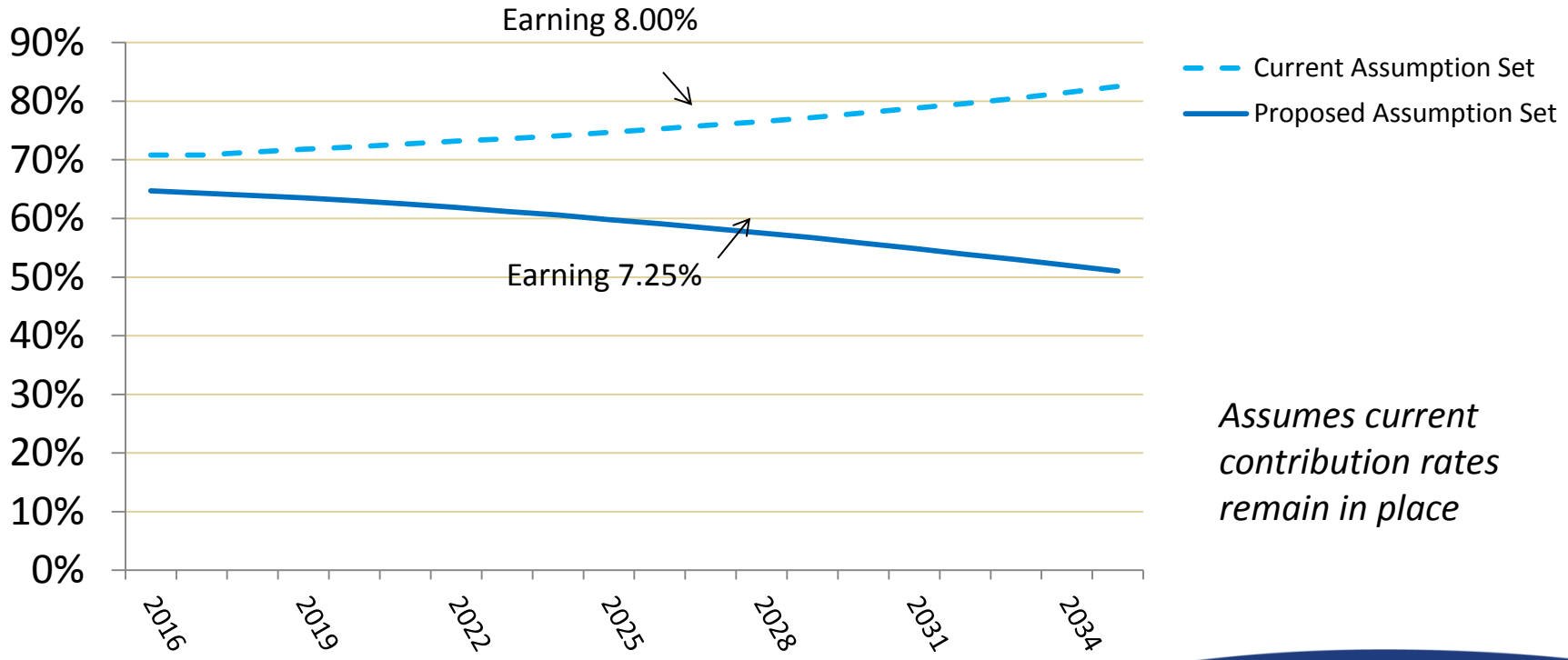
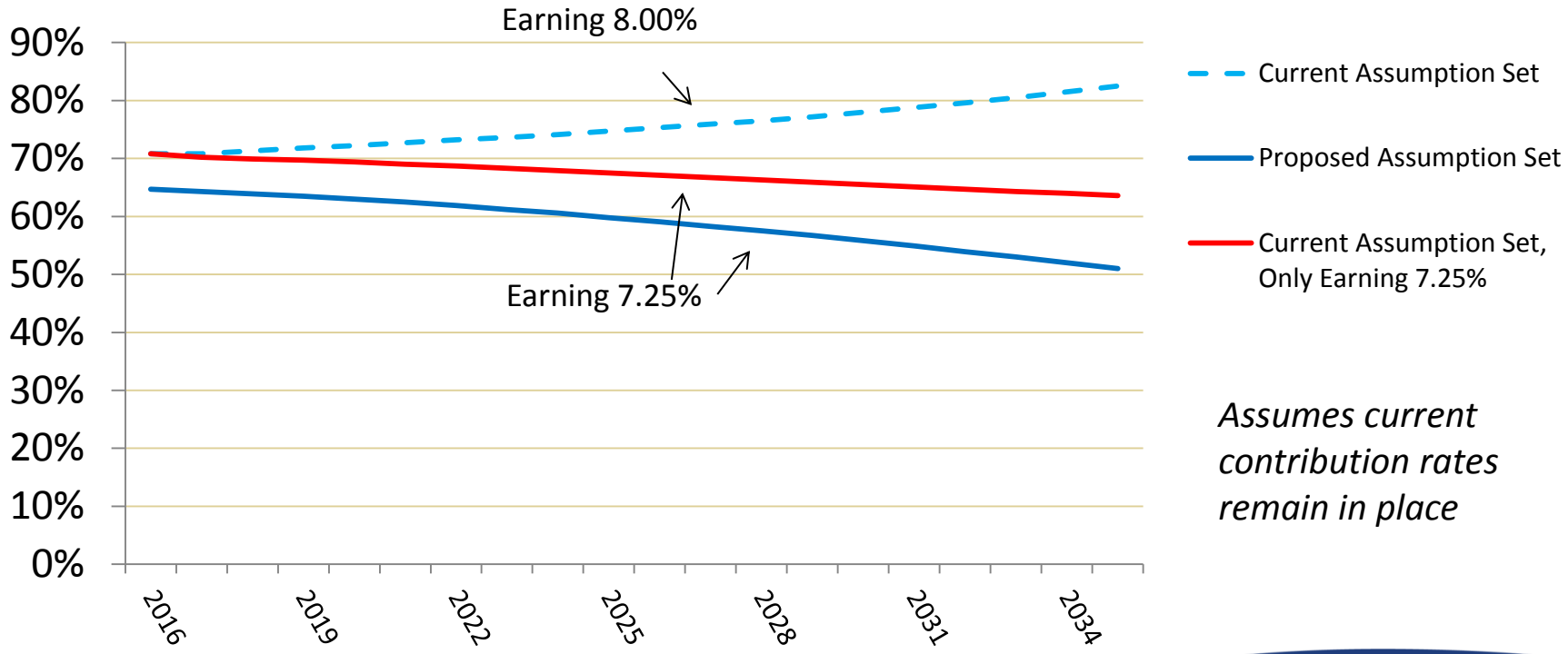
Projected Funded Ratio
Based on MVA as of August 31, 2016



Assumes current contribution rates remain in place

GRS Retirement Consulting

Projected Funded Ratio
Based on MVA as of August 31, 2016



Assumes current contribution rates remain in place

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Discussion and Next Steps

- The Board will be asked to adopt a new set of assumptions at the August meeting
- The new assumptions will be used in the August 31, 2017 valuations

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Actuary's Qualifications

- We believe the recommended set of actuarial assumptions should present a more accurate portrayal of ERS's financial condition and should reduce the magnitude of future experience gains and losses.
- The study was conducted in accordance with generally accepted actuarial principles and practices and with the Actuarial Standards of Practice issued by the Actuarial Standards Board
- All signing actuaries meet the Qualification Standards of the American Academy of Actuaries

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Questions?